

webs of the quills. The tinge on the tail is of a somewhat darker blue than in the smaller species, and the tip of the tail is much more red.

The female has the pileum of a golden-green tint, and the abdomen is entirely green without any orange tint.

Total length 6·3 inches (=158 mm.), wing 3·5 (=87) tail 3·3 (=83), bill 0·7 (=15), tarsus 0·65 (=14).

Hab. S.E. New Guinea : Owen Stanley Mountains (types), Mount Scratchley, Mount Knutsford (*Antony*); ? Aroa River (*Waiske*).

The types of this species are in the British Museum; they have been figured in Dr. Mivart's Monograph.

There appears to be no doubt about the identity of *O. viridigaster* De Vis with *O. grandis*. I think that *O. frontalis* is based on immature specimens of *O. grandis*; the male has been described as having a narrow frontal red band, like immature male birds of *O. arfaki*.

[To be continued.]

XXVI.—*On the Display of the Lesser Bird-of-Paradise*
(*Paradisca minor*). By W. R. OGILVIE-GRANT.

(Plate VIII.)

OWING to the great difficulty and expense of procuring living examples of the Birds-of-Paradise (*Paradisceidæ*), comparatively few have reached the Zoological Society's Gardens in the Regent's Park. Since 1862 the Society has only managed to procure about eighteen specimens, representing seven different species, viz. :—

3 *Paradisca apoda*. Great Bird-of-Paradise.

(1 ♂, Oct. 1885; 1 ♂, June 1902; 1 ♂, March 1905.)

9 *Paradisca minor*. Lesser Bird-of-Paradise.

(2 ♂, April 1862; 2 ♂, May 1878; 3 ♂, April 1884; 2 ♂, March 1905.)

1 *Paradisca rubra*. Red Bird-of-Paradise.

(1 ♂, March 1881.)

1 *Ptilorhis paradisca*. Australian Rifle-Bird.

(1 ♂, April 1882.)

- 1 *Seleucides nigricans*. Twelve-wired Bird-of-Paradise.
(1 ♂, March 1881.)
2 *Cicinnurus regius*. King Bird-of-Paradise.
(2 ♂, Oct. 1904.)
1 *Manucodia chalybea*. Green Manncode.
(1 ♂, March 1881.)

At the present time no fewer than five adult male examples of the three species, *P. apoda*, *P. minor*, and *C. regius*, are to be seen in the large aviaries in the Insect-House, the two examples of the last-named species being the first brought alive to this country. All these birds, along with others, including females, which unfortunately died, were procured for Mrs. E. J. Johnstone by Mr. Walter Goodfellow, whose name is well known to the readers of 'The Ibis' from his interesting account of his travels in South America and the birds that he met with there.

The two King-Birds were afterwards purchased for the Gardens, and the examples of *P. apoda* and *P. minor* were subsequently deposited there by their owner.

At the date of writing (April 6th, 1905) only one example of *P. minor* is in full plumage, the other male having shed the whole of its ornamental side-plumes, while the male of *P. apoda* is also rapidly moulting.

The King-Birds came into full plumage in February, and grew their long ornamental middle tail-feathers with beautiful tight-curved green tips; but after about three weeks both birds shed these feathers, though they retained their ornamental side-plumes.

Finding that the examples of *P. apoda* and *P. minor* exhibited in the Bird-Gallery at the Natural History Museum, in supposed attitudes of display, were quite wrongly mounted, I have been at considerable pains to make a careful study, with sketches, of the full-plumaged male of *P. minor* now to be seen in the Gardens, and to ascertain what postures he assumes.

The following account of his general behaviour and mode of display, the result of a number of early visits to the Gardens, is, I believe, accurate in every detail, and has been

checked and verified by other observers who have accompanied me. The illustrations, drawn from sketches made by Mr. G. E. Lodge and myself with the birds before us, faithfully represent what we saw.

The display almost always takes place in the early morning, between 8 and 9 o'clock; but the Keeper has informed me that on one occasion the bird was seen to "show off" as late as 11.30 A.M. This occurred on a morning when the early hours had been exceptionally dull, but were followed by bright sunshine. *P. minor* has never been observed to display in the afternoon, though *P. apoda* is said to have done so.

On bright sunny mornings the Lesser Bird-of-Paradise has been seen to display seven times in about an hour. The first two displays are generally the longest, and last from four to nine minutes; but they gradually decrease in duration as the bird becomes exhausted, till the final one, which is only sustained for about fifteen or twenty seconds, and may not reach the second or acute stage.

The figures of *P. apoda* and *P. minor* displaying, given in Wallace's 'Malay Archipelago' and Sharpe's 'Monograph of the *Paradisæide*' respectively, only shew the first stage of the display; and the final stage shown in Mr. Lodge's coloured drawing (Plate VIII.) has never, so far as I am aware, been figured or properly described.

The purely fanciful figure of *P. minor* by J. Smit, in Elliot's Monograph (plate 4), is wrong in almost every detail, as may be seen by comparing it with Plate VIII.

When at rest in the early morning the bird's long side-feathers hang below the perch with a graceful sweep (text-fig. 21, p. 432); in this position he often remains inactive for long periods, especially if the morning is dull, and on such occasions we have sometimes waited for two hours or more, during which he hardly stirred.

As the morning brightens he periodically rouses himself, and after a few trial-notes and grunts,

ēw, ōrk: ē, ōrk,

which sound exactly like the preliminary notes made by a

trombone-player in an orchestra, utters his ordinary loud cries :

(1) *wāū*! *wōk-i-wōk*, *wūck*, *wūck*, *wāck wāck wāck*, *wūck*!
wōk! **wōk!**

or

(2) *wāū*! *wāck*, *wāck*, *wāck*, *wāck*! **wōk!**

Text-fig. 21.



Paradisea minor.

(Ordinary attitude when in repose.)

or, again, an ear-piercing

(3) *wak-i-wak!* *wūk*, *wūk*, *wūk*, *wūk*, *wūk*, *wūk*, *wūk*, *wūk*! (very quickly delivered), **wauk!**

Another call, delivered in a higher key, may be written as

(4) *quā*, *quā*, *quā*, *quā*! **wā!** **wōw!** **waugh!**

The last syllables in all these cries, as indicated by the blacker type, are very loud and emphatic.

Another variation, less often uttered, commences in a high falsetto and sounds like:

(5) *wēc-cā, cā, cā, cā, wā, wā!* **whee-ew!** (whistled).

Yet another combination of sounds is:

(6) *wāā!* *wōk!* *wā!* **whee-ew!** **whee-ew!**
whee-ew! (whistled), **wā!**

or

(7) the same sounds may be reversed, without the preliminary *wāā!*

Besides the cries that I have endeavoured to write down, many other variations and combinations of the sounds given above may be heard from time to time; and among the bird's *répertoire* is one which is apparently a faithful reproduction of the well-known call of the "Yaffle," and another like the despairing sounds of a hen that has been caught and is about to have its neck wrung. It is not unlikely that the Paradise-Birds, like so many other members of the Crow-tribe, may possess the power of imitating any sounds they hear, and that this individual, while living in Mrs. Johnstone's aviary, may have learned to mimic the cries of the Green Woodpecker and the moribund fowl.

While sitting at rest the bird also utters many little crooning sounds and growlings in every sort of key. When giving vent to these cries he does not alter his stationary position, but merely stretches out his neck with the bill in a semi-vertical position. Before each syllable is uttered the chest is momentarily swelled out; as it subsides, the throat becomes distended and simultaneously the gape is opened wide and the note or sound delivered with great force (text-fig. 22, p. 434).

As the morning sun begins to stream through the glass roof of the Insect-House, and the temperature of the aviaries rapidly rises, the bird becomes more lively. Flying from perch to perch he takes a few mouthfuls of food, stopping now and then to preen and arrange his gorgeous plumage.

The side-plumes, it should be noted, are ordinarily disposed on either side of the tail, which is fully visible between the

Text-fig. 22.



Paradisea minor.
(Calling.)

two graceful masses of long drooping feathers (text-fig. 23, p. 435).

Presently the increasing warmth seems to stir his blood, and he begins to move in a more excited manner, and straining forward from his perch with slightly opened, quivering wings, utters a loud cry in a high key :

wāu! wāu! wāu! wāu!

Text-fig. 23.



Paradisæa minor.

(Shewing the ordinary position of tail in relation to the side-plumes.)

This cry, which generally precedes the display, is usually uttered two or three times at short intervals, and is sometimes varied by a long series of ear-piercing yells. Immediately

after the second or third repetition, the wings are suddenly held out in a semi-vertical position on either side of the body, the tail is bent forward under the perch, and, with a quick shuffle of the plumage, the side-plumes are erected and form an arched cascade over the back, meeting one another in the middle line and completely hiding the depressed tail when the bird is viewed from behind.

Text-fig. 24.



Paradisea minor.
(First stage of the display.)

In this position the bird appears to be on the point of falling backwards, and the legs form a horizontal right-angle with the perch, the whole weight of the body being apparently supported by the strong toes, which grasp the branch with all

the nervous energy of which they are capable (text-fig. 24). This is the first stage of the display; and with every

Text-fig. 25.



Paradisca minor.

(Dancing attitude preceding second stage of the display.)

muscle tense, the bird often remains in this attitude from ten to twenty seconds, slightly quivering his wings, and

from time to time hitching up his long plumes, which are raised somewhat above the level of the top of the head. This stage is fairly correctly represented by Gould and Hart in Sharpe's 'Monograph of the *Paradisæidæ*,' part vii. (1897)*.

Suddenly the second stage commences. The bird, seemingly gone mad, commences to dance and hop wildly backwards and forwards along the perch, and with head bent down, wings fully extended horizontally, and side-plumes erected to their utmost, he utters loud harsh cries :

cā! cā! cā! cā!

(text-fig. 25, p. 437).

For some seconds he remains in a sort of ecstacy, rubbing his bill on the perch, and occasionally glancing backwards below his feet with the back fully arched (Plate VIII.).

Presently, the climax being over, he reverts once more to the first, more erect, stage of the display, when the paroxysm either gradually subsides, or is renewed and, after an interval of about half a minute, again reaches the acute stage.

At no time during the display do any of the side-plumes droop forward over the head, as has been stated; even when the latter is lowered under the perch, they still curve *backwards*. An examination of the way in which these feathers are inserted in the skin seems to indicate that it is physically impossible for the bird to direct them over its head, and the shafts are so stiff that they do not naturally fall forwards when erected. The wings are invariably carried *outside* the side-plumes. All the figures by Wolf and Smit, &c., shewing the plumes outside the wings are certainly wrong.

Occasionally the bird stops dead in the middle of his display, his attention being suddenly attracted by some outside interest, such as a Wood-Pigeon or Carrion-Crow passing over the Insect-House. Standing very erect on the perch, the wings are loosely dropped to the sides of the body, the side-plumes partially lowered, and the neck stretched upward. In this position he sometimes remains staring about

* The Great Bird-of-Paradise (*P. apoda*) in this stage of the display is very accurately shown in the drawing by T. W. Wood which forms the frontispiece to Wallace's 'Malay Archipelago,' vol. ii. (1869).

him for a minute or more, looking for all the world like a domestic cock of some abnormal breed (text-fig. 26).

Text-fig. 26.



Paradisca minor.

(Sudden alarm during the display.)

Bartlett (in Elliot's 'Monograph of the *Paradiseide*'), speaking of *P. minor*, writes:—"When uttering their loud call the body was bent forward, the wings spread open and raised up, frequently over their heads, meeting the plumes,

which were spread in a most graceful manner, each feather vibrating in a way that almost dazzled the sight. During this display the bird would become greatly excited, and sometimes turn almost under the perch or branch, the head and neck being bent so low down."

Reading this, which was apparently written from memory for Elliot's Monograph, we get no idea of the position of the plumes, but the last lines shew that Bartlett must have witnessed the final stage of the display, which has been fully described above and figured.

It may be worth noting that when scratching their heads the Birds-of-Paradise, like other Passeres, bring the foot over the wing and side-plumes, although the operation is apparently conducted with some difficulty. Under the circumstances we should almost have expected these birds to adopt the more simple mode employed by other birds, such as Parrots.

At my suggestion, Mr. W. P. Pycraft has made a careful examination of the dermal muscles which control the side-plumes in *P. minor*, *P. apoda*, and allied forms; and the results of his investigations will be found in the memoir following.

XXVII.—*On the Pterylography and Dermal Myology of the Lesser Bird-of-Paradise, with especial reference to the "Display."* By W. P. PYCRAFT, F.Z.S., A.L.S., &c.

INTRODUCTORY.

WHEN Mr. Ogilvie-Grant suggested to me that I should endeavour to explain the mechanism by which the extraordinary display of *Paradisea minor* is effected, so as to form a supplement to his own paper on the subject, I had unfortunately no example of that species at hand for examination. Through the kindness of Mr. Beddard, however, this matter was soon remedied by the loan of a specimen in spirits from the collection under his charge at the Prosecurtorium of the Zoological Society. The complement to this



PARADISEA MINOR.

(Final stage of the display.)